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| 09/919,452 | 07/31/2001 | Arthur W. Wetzel | 044595-5004 | 3675 |

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| EXAMINER | |
|---|---|
| AZARIAN, SEYED H | |
| **ART UNIT** | **PAPER NUMBER** |
| 2625 | |

DATE MAILED: 09/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/919,452 | WETZEL ET AL. | |
| | Examiner | Art Unit | |
| | Seyed Azarian | 2625 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *31 July 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-74* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,16-43,53-54,65-74* is/are rejected.

7)☒ Claim(s) *14,15,44-52 and 55-64* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 July 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3,5,6,7,8*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

1. Color photographs and color drawings are acceptable only for examination purposes unless a petition filed under 37 CFR 1.84(a)(2) is granted permitting their use as acceptable drawings. In the event that applicant wishes to use the drawings currently on file as acceptable drawings, a petition must be filed for acceptance of the color photographs or color drawings as acceptable drawings. Any such petition must be accompanied by the appropriate fee set forth in 37 CFR 1.17(h), three sets of color drawings or color photographs, as appropriate, and, unless already present, an amendment to include the following language as the first paragraph of the brief description of the drawings section of the specification:

> The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the Office upon request and payment of the necessary fee.

Color photographs will be accepted if the conditions for accepting color drawings have been satisfied.

## Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2, 4-13, 16-23, 26-31, 33 and 43, are rejected under 35 U.S.C. 102(b) as being anticipated by Ortyn et al (U.S. patent 5,875,258).

Regarding claim 1, Ortyn discloses an imaging apparatus, comprising, a motorized stage (column 7, lines 38-49, stage 21, and Fig. 1, column 6, line 66 through column 7, line 13, microscope, slide and motor drivers 526);

a camera focused relative to said motorized stage; and a processor (Fig. 1b, item 550 processor), coupled to said camera (CCD camera 512), wherein said processor contains instructions which, when executed by said processor, cause said processor to, capture an image that is incident on said camera (column 6, lines 44-65, capturing image comprising automated microscope);

wherein the image includes a plurality of pixels and the pixels have a characteristic (Fig. 6, column 13, lines 10-33, array of pixels for each acquired image is computed);

establish the characteristic for each pixel, and determine which pixels contain a target image based on the characteristic of the pixels (column 13, lines 11-25, calibration and test target into the optical path, also column 14, lines 18-34, target is introduced into the optical path at process step and capturing image pixels and generating histogram, and evaluating comparison).

Regarding claim 2, Ortyn discloses an imaging apparatus of claim 1, wherein said characteristic includes pixel intensity (column 18, lines 40-52, pixel intensity).

Regarding claim 4, Ortyn discloses the imaging apparatus of claim 1, wherein said determining which pixels contain a target image based on the relative intensity of the pixels includes, determining a mean intensity of the pixels, comparing the intensity of each pixel to the mean intensity (Fig. 6, column 13, lines 11-32, also column 13, lines 18-33, target of optical pat and determining mean intensity of pixels and comparing);

and dividing the pixels into a group of non-target image pixels having high intensities and a group of target image pixels having intensity lower than the high intensity pixels (Fig. 12, column 15, lines 17-35, different between highs and lows pixel values).

Regarding claim 5, Ortyn discloses the imaging apparatus of claim 1, wherein said determining which pixels contain a target image based on the relative intensity of the pixels includes, determining an intensity standard deviation for the pixels that provides an amount of variation in pixel intensity, comparing the intensity of each pixel to the intensity standard deviation; and dividing the pixels into a group of non-target image pixels having low standard deviations and a group of target image border pixels having a standard deviation that is greater than the standard deviation of the pixels having low standard deviations (see claim 4, also column 47, lines 5-43, standard deviation of minimum and maximum pixel intensities).

Regarding claim 6, Ortyn discloses the imaging apparatus of claim 1, further comprising a pulsed light directed toward said motorized stage (column 6, lines 45 through column 7, line12, provide illumination intensity and motor drive 522, also column 12, lines 22-35, pulse).

Regarding claim 7, Ortyn discloses the imaging apparatus of claim 1, further comprising a stage position sensor adjacent said motorized stage (column 41, lines 47-66, moving stage for best focus).

Regarding claim 8, Ortyn discloses an imaging apparatus, comprising: a motorized stage (Fig. 1, column 6, line 66 through column 7, line 13, motor drivers 526);

a camera having a lens directed toward said motorized stage (Fig. 15, column 18, lines 28-38, plurality of lens);

and a processor coupled to said camera, wherein said processor contains instructions which, when executed by said processor, cause said processor to (column 6, lines 44-65, capturing image comprising automated microscope);

select at least three points of a sample (column 13, lines 10-33, array of pixels for each acquired image), adjacent said motorized stage, determine stage position for each selected point, focus said camera on each selected point; determine object distance from the camera lens to the sample at each selected point, and develop a focus surface based on stage position and object distance for the at least three selected points (column 35, lines 34-59, determine positioning from different distance, also column 36, lines 48-67, optical path and different points).

Regarding claim 10, Ortyn discloses the imaging apparatus of claim 9, wherein selecting points dependent on a characteristic of the image of those points includes selecting the darkest regions (column 46, lines 47-58, dark field).

Regarding claim 11, Ortyn discloses the imaging apparatus of claim 9, wherein selecting points dependent on a characteristic of the image of those regions includes

selecting the lightest regions (Fig. 14, column 18, lines 3-26, respect to the light level).

Regarding claim 12, Ortyn discloses the imaging apparatus of claim 9, wherein selecting points dependent on a characteristic of the image of those regions includes selecting points having a high contrast relative to the regions (Fig. 17, column 19, lines 39-63, contrast curve).

Regarding claim 13, Ortyn discloses the imaging apparatus of claim 8, wherein said selecting at least three points of a sample adjacent the motorized stage includes, determining a distribution of the at least three selected points within the sample, determining whether at least one selected point lies within each of at least two predetermined areas; and selecting additional points until at least one point lies within each predetermined area (see claim 8, also column 42, lines 1-27).

Regarding claim 17, Ortyn discloses the imaging apparatus of claim 16, further comprising a processor coupled to said camera, said pulsed light and said stage position sensor, wherein said processor contains instructions which, when executed, cause said processor to, initiate motion of the motorized stage; energize the pulsed light when the stage position sensor indicates the motorized stage is in a predetermined position; and capture an image by way of the camera while the pulsed light is energized (column 35, line 60 through column 36, line 9frequency energy in the focus plus).

Regarding claim 18, Ortyn discloses the imaging apparatus of claim 16, wherein the motorized stage moves continuously while capturing images (column 41, line 47 through column 42, line 12, the stage continues to move).

Regarding claim 19, Ortyn discloses a system for creating a high throughput montage image of microscope slides, the system comprising, an optical system that comprises at least one camera, a motorized stage for moving a slide while an image of the slide is captured, a pulsed light illumination system that optically stops motion on the motorized stage while allowing continuous physical movement of the motorized stage, and a stage position detector that controls firing of the pulsed light illumination system at predetermined positions of the motorized stage, a plurality of first components that identifies tissue regions on the slide in the optical system and determines locations of tissue on the slide, wherein the plurality of first components use information about the locations to generate control parameters for the motorized stage and the camera, a plurality of second components that use the control parameters to ensure that a high-quality montage image is captured (see claim 1, column 2, lines 40-67, processing quality, illumination quality, image quality and position quality).

Regarding claim 20, Ortyn discloses the system of claim 19, wherein the optical system is a bright field microscope (column 12, lines 38-47, optical path is placed to split the light (bright field).

Regarding claim 21, Ortyn discloses the system of claim 19, wherein the pulsed light illumination system is a standard strobe light, and wherein stage location is determined by the stage position detector, the stage location executes the strobe light and the system does not depend on uniform motion of the motorized stage over an imaged area to execute the strobe light (see claim 1, also, column 41, lines 47-67, stage position).

Regarding claim 22, Ortyn discloses the system of claim 21, wherein the camera is free running and the motorized stage speed is matched to the camera's frame rate to an extent that prevents execution of the pulse light illumination system from falling outside of an exposure window (column 9, line 55 through column 10, line 3, if a measured parameter is outside of limits, result in termination of operation).

Regarding claim 23, Ortyn discloses the system of claim 19, wherein the pulse light illumination system is any pulsed light source (Fig. 4, column 12, lines 22-46, pulls and light source).

Regarding claim 27, Ortyn discloses the system of claim 18, wherein the pulse illumination system is fired whenever the stage position detector determines that the motorized stage has moved into a neighboring field of view of the camera (column 9, line 55 through column 10, line 4, parameter is outside).

Regarding claim 28, Ortyn discloses the system of claim 19, wherein signals from the stage position detector represent motions of the motorized stage, and wherein timing of the signals vary depending on speeds of the motorized stage (column 42, lines 47-64, time and speed processing).

Regarding claim 31, Ortyn discloses the system of claim 21, wherein the plurality of first components include an image cropping component for identifying tissue regions on the slide to be scanned, wherein the image cropping component: determines an approximate location of a slide boundary by searching upper and lower intervals corresponding to regions expected to contain upper and lower edges of the slide (column 15, lines 47-65, values between highest and lowest pixels);

re-examines the approximate location to determine a more accurate location; and removes portions of the image falling outside of the determined slide boundary (Fig. 8, column 15, line 66 through column 16, line 22, comparing).

33. The system of claim 30, wherein the image-cropping component identifies pixel blocks that are likely to contain remaining boundary edges and flag the blocks as edges that should not be considered for high-resolution imaging.

Regarding claim 33, Ortyn discloses the system of claim 30, wherein the image cropping component identifies pixel blocks that are likely to contain remaining boundary edges and flag the blocks as edges that should not be considered for high-resolution imaging (column 9, lines 11-30, system fails and error message).

Regarding claim 43, Ortyn discloses the system of claim 18, wherein the plurality of first components include a scan control component that interprets a tile matrix, outputted by a tissue finding component, and transposes positions of the tile matrix into actual stage coordinates for a microscopic imaging (column 2, lines 26-37, test slide and specimen analysis, and column 37, lines 5-29, the specimen on the slide and filtering).

Regarding claims 9,16, 26 and 29-30, it recites similar limitation as claims 1, 8 and 28 are similarly analyzed.

## Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 3, 32, 34-42, 53-54, 65-70 and 73-74, are rejected under 35 U.S.C. 103(a) as being unpatentable over Ortyn et al (U.S. patent 5,875,258) in view of Weisman et al (U.S. patent 6,674,879).

Regarding claim 3, Ortyn fails to disclose, "color pixel". On the other hand Weisman in the same field of X-ray teaches screen indicating the structure for selection for interpretation by the physician and color of the movement of the image (Fig. 5-7, column 3, lines 52-67).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to modify Ortyn invention according to the teaching of

Weisman because it provides the difference between the highest and lowest frequencies, which contributes to color quantitation allows the viewer to easily visualize between normal and abnormal for better result and accuracy.

Regarding claim 32, Ortyn fails to disclose "thumbnail image". On the other hand Weisman in the same field of X-ray teaches screen indicating the image sequence is also displayed, in the main viewing area of the display as a miniaturized thumbnail icon for easy retrieval of the corresponding image sequence (column 5, lines 43-56).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to modify Ortyn invention according to the teaching of Weisman because it provides reduced images or miniaturized icon for easy retrieval of image sequence, which can easily be implemented in an images device such as X-ray machine.

Regarding claim 34, Ortyn discloses the system of claim 18, wherein the plurality of first components include a tissue finding component that locates region in the thumbnail image that contain tissue of interest to a specialist (see claim 32 and column 38, lines 21-64, filter response sensitive to object of interest such as cell nuclei).

Regarding claim 35, Ortyn discloses the system of claim 34, wherein a cropped image is inputted into the tissue finding component from an image cropping component, wherein the tissue finding component identifies tissue regions by applying a sequence of filters that incorporate knowledge of typical appearance and location of tissue and non-tissue slide regions and outputs a tiling matrix having values that indicate which tiles should be imaged (column 2, lines 26-37, test slide and specimen analysis, and

column 37, lines 5-29, the specimen on the slide and filtering, also column 38, lines 21-64, filter response sensitive to object of interest such as cell nuclei).

Regarding claim 36, Ortyn discloses the of claim 35, wherein a first filter analyzes mean pixel intensity to generate a threshold value for making an initial classification of tissue versus non-tissue regions (column 40, lines 14-33, threshold range).

Regarding claim 37, Ortyn discloses the system of claim 35, wherein a first filter analyzes a difference between pixel intensities to generate a threshold value for making an initial classification of tissue versus non-tissue regions (Fig. 3, column 12, lines 12-20, change of intensity between the pixel and Fig.12, column 15, lines 18-35, generating a histogram between pixels intensity).

Regarding claim 39, Ortyn discloses the system of claim 38, wherein the intensities are used to differentiate tissue-containing regions from blank regions and other non-tissue containing regions and the standard deviation represents the amount of variation in pixel values and is therefore a good indicator of the border between tissue and the blank slide (column 38, line 65 through column 39, line 21, viewing the blank image).

Regarding claim 40, Ortyn fails to disclose "the morphological filter". On the other hand Weisman in the same field of X-ray teaches morphological opening and closing is performed and out-of-tolerance boundary points are invalidated (column 9, lines 47-63).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to modify Ortyn invention according to the teaching of

Weisman because it provides fine foreground filtering to remove holes, noise and artifact from difference image without losing desired signal information, which can implement in image processing device such as X-ray or tomography.

Regarding claim 53, Ortyn discloses a method for creating a high throughput montage image of microscope slides, the method comprising, placing a slide to be imaged in a slide holder on a motorized stage (column 35, lines 53-67, positioning of the slide);

pre-scanning a thumbnail image of the slide to identify tissue locations on the slide (see claim 43);

generating necessary control parameters to scan only the regions of interest under microscopic optics (column 34, line 65 through column 35, line 10, field of interest);

capturing a high quality montage image by enabling accurate focus control of optical elements without requiring that the motorized stage be stopped and refocused at each tile location in the montage image, controlling a tiling process by moving the motorized stage; capturing image tiles with precise alignment by executing a strobe illumination system whenever a stage position sensor determines that the motorized stage has moved to a neighboring field of view of a camera (column 17, lines 11-30, calibration of test target and maximum variation and minimum variation are computed for a predetermined portion of the field of view);

scanning each row of locations identified to contain tissue for tissue; and removing the slide and inserting another slide to be imaged (column 8, lines 34-45,

loading slide from the tray for validation).

Regarding claim 73, Ortyn discloses the method of claim 53, wherein capturing further comprises capturing images of tiles with precise alignment until a row is finished (column 8, lines 34-46).

Regarding claim 74, Ortyn discloses the method of claim 53, wherein capturing further comprises capturing images of tiles with precise alignment until a controlling program tells the system to stop (column 9, lines 44-67, stop processing).

Regarding claims 38, 42, it recites similar limitation as claims 36 and 37, are similarly analyzed.

Regarding claims 41 and 54, it recites similar limitation as claims 32 and 35 are similarly analyzed.

Regarding claims 65-70, it recites similar limitation as claims 31-37 are similarly analyzed.

6. Claims 24-25 and 71-72, are rejected under 35 U.S.C. 103(a) as being unpatentable over Ortyn et al (U.S. patent 5,875,258) in view of Hart (U.S. patent 5,592,313).

Regarding claim 24, Ortyn fails to disclose "Ronchi ruler (diffract grating)". On the other hand Hart teaches the light produced by light source and directs the collimated beam through diffraction grating, the desired focal length between source and lens (column 29, line 65 through column 30, line 11).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Ortyn's invention according to the teaching of Hart because it provides pattern of dots centered at the optical center of the lens at a distance determined by the desired line spacing, which increase search range and achieve a better prediction that can implements in a image processing device, such as X-ray machine.

Regarding claim 25, Ortyn discloses the system of claim 24, wherein the stage position detector utilizes a light sensor that is mechanically isolated from the Ronchi ruler, wherein as the ruler passes under the sensor, a series of electronic pulses that correspond to the alternating light and dark bands of the Ronchi ruler is generated and the series of electronic pulses is used to monitor the position and direction of the motorized stage (see claim 24, also column 22, lines 35-50).

Regarding claims 71-72, it recites similar limitation as claims 24 and 25, are similarly analyzed.

## Allowable Subject Matter

7. Claims 14-15, 44-52 and 55-64, are objected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitation of the base claim and any intervening claims.

## Other prior art cited

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. patent (5,216,596) to Weinstein is cited for telepathology diagnostic network.

U.S. patent (5,647,025) to Frost et al is cited for automatic focusing of biomedical specimen's apparatus.

U.S. patent (5,073,857) to Peters et al is cited for method and apparatus for cell analysis.

U.S. patent (6,151,405) to Douglass et al is cited for system and method for cellular specimen grading.

U.S. patent (6,272,235) to Bacus et al is cited for method and apparatus for creating a virtual microscope slide.

## **Contact Information**

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Azarian whose telephone number is (703) 306-5907. The examiner can normally be reached on Monday through Thursday from 6:00 a.m. to 7:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached at (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR.
Status information about the PAIR system, see http:// pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Seyed Azarian

Patent Examiner

Group Art Unit 2625

September 21, 2004

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
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